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14MAR02 E703448-2 D02879
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Patent application number
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0205977.2

Full name, address and postcode of the or of
each applicant (underline all surnames)

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Patents ADP Number (if you know it)

7419294001

If the applicant is a corporate body, give the
country/state of its incorporation

THE NETHERLANDS

Title of the invention

FINDING TV ANYTIME WEB SERVICES

Name of your agent (if you have one)
"Address for service" in the United Kingdom
to which all correspondence should be sent
(including the postcode)

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Patents ADP number (if you know it)

7133 473 002

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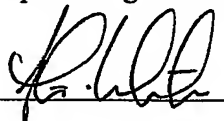
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DESCRIPTION

FINDING TV ANYTIME WEB SERVICES

5 This invention relates to finding TV Anytime web services using a server based file with a well-known name, location and structure.

 The TV Anytime Forum is in the process of standardising a set of web services which allow TV Anytime clients (e.g. PDRs - Personal Digital Recorders) to retrieve TV Anytime data (e.g. program schedules, descriptions, etc.) from TV Anytime IP (Internet Protocol) servers. Different types of TV Anytime web services can be offered from a given web site and can have different, unrelated URLs (Uniform Resource Locators). The object of this invention is to allow a PDR to automatically find out whether an arbitrary web site offers TV Anytime services, and if so which types of services it offers.

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1. State of the art

 TV Anytime (<http://www.tv-anytime.org>) has not specified mechanisms for discovering TV Anytime web services. The following work is relevant:

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1.1 Use of DNS for finding a TV Anytime service for a particular program identifier

 This mechanism is described in the TV Anytime Content Referencing specification (<ftp://tva@ftp.bbc.co.uk/pub/Specifications/SP004v11.zip> - password "tva"). Given a CRID (Content Reference Identifier), DNS (Domain Name Service) is used to request the machine name and port of a server which is able to provide a TV Anytime service that offers particular information about that CRID. However, once this service has been found it offers no information on the presence or otherwise of other TV Anytime services on the same server. Moreover, not all TV Anytime service types can be found using this

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deterministic mechanism. For example, if the PDR wishes to find a server that allows the user to search for programmes, then DNS is not helpful.

1.2 Use of UDDI (Universal Description, Discovery and Integration)

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UDDI (<http://www.uddi.org>) represents one technology for facilitating the discovery of web services. It relies on the use of third party service repositories that provide a type of web service "Yellow Pages". By querying the repository a device is able to find web services which match a certain technical description and perhaps match some other taxonomy classification. The approach provides a solution to the problem, "How do I find a list of services that provide a certain service type and are TV Anytime compliant?".

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1.3 Use of web robots / spiders to index a web site

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For traditional static web content (i.e. HTML pages) a web robot can be used to find and index the content of a site. The information gained is stored and used for tools such as search engines. However, this is not well suited for direct use by a PDR (it is a slow process, involving multiple network transactions), nor is it particularly useful when the content is dynamically generated by a web service. Although a method could be conceived whereby a TV Anytime search engine blindly tries to discover services by testing their behaviour, this would be prohibitively slow, error prone and not guaranteed to find all the TV Anytime services provided by that site.

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1.4 Use of a robots.txt file (<http://www.robotstxt.org/wc/robots.html>)

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By placing a robots.txt file in a well-known place on a server (e.g. <http://foo.com/robots.txt>) a server is able to specify a set of rules for the whole web site, which compliant web robots will obey. Whilst not directly relevant to TV Anytime, this is an example of the use of placing a file (with well-known name,

structure and location) on a web server to provide information about the web site that can be used both automatically and manually.

2. The problem

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This invention provides a solution to the problem, "How do I know if this web-site offers any TV Anytime services, and if it does where are they?" A solution is needed for two reasons. Firstly, a PDR may be aware of a particular web site (i.e, machine name and port number) as a result of any number of processes (see section 3). It would be useful if the PDR can automatically find whether TV Anytime web services are available. Having established this, the PDR should be able to deduce the types of services offered and where they are offered. Secondly, there is likely to be a market for third party sites that categorise and index the available TVAnytime services (the TV Anytime equivalent of a web directory or search engine). By providing a standardised description mechanism a web tool is able to automatically discover and categorise TV Anytime services without the need for human intervention.

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Once the PDR has established the existence of TV Anytime services it needs to find out the following information about each of those services:

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- the location where that service is being offered,
- the type of TV Anytime service being offered,
- the technical compliance of that service,
- and the version number of that TV Anytime service.

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3. What is proposed

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The mechanism proposed is to place a file on the server, which has a standardised structure containing the necessary information. This file has a well-known name and is placed at the entry point to the website, thus allowing a PDR to retrieve the file automatically. The invention specifically includes the use of the WS-Inspection standard to define the file structure and name of the file (*inspection.wsil*).

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The invention assumes that the PDR already has knowledge of a particular web site. The domain name could have been obtained by the following mechanisms:

1. The user has heard of a TV Anytime service through some other medium (e.g. recommendation or advertising) and manually enters the domain name into their PDR.

2. The PDR might support a web browser to allow the user to web surf It ~~would be relatively inexpensive for a PDR to attempt to download the TV Anytime file (if any) of the web sites visited by the user.~~

3. The DNS mechanism discussed in section 1.2.

4. A PDR might receive CRIDs from a number of different sources (e.g. embedded in the video stream, as a result of searches, as a result of a program recommendation, or as a result of a remotely generated request to record a program). The authority name can be extracted from CRIDs and used as the domain name in an attempt to find a TV Anytime server file.

According to a first aspect of the present invention, there is provided a method for finding TV Anytime web services comprising querying a known address, obtaining a file from said address, said file having a predefined structure, and parsing said file to obtain URLs for TV Anytime web services

According to a second aspect of the present invention, there is provided apparatus for finding TV Anytime web services comprising processing means and communicating means arranged to carry out the above method.

If a web site does offer TV Anytime services it places a file with a well known name at the entry point to that web site. To obtain the file the PDR makes an HTTP GET request to the following URL. *http://<machine name>:<port number>/<well known file name>* The port number is optional and typically would not be included. The exception is case 3 above, where the DNS mechanism will explicitly return a port number as well as a machine name. A machine-readable document (this could be XML but does not have to be) is returned which indicates the presence of TV Anytime services by containing references (URLs) to one or more service description files. This invention does not mandate the type of service description file that should be

used, but specifically includes the use of WSDL (Web Services Description Language) and UDDI to provide the four pieces of information listed in section 2. Each service description file may, in turn, provide information on more than one TV Anytime service depending on how the web site chooses to group their web services. The document may also give the URLs of other related TV Anytime server files to facilitate the discovery and linking together of new services. The mechanism has the following advantages:

- Lightweight and easy for a web site to implement.
- Allows a new TV Anytime web server to describe itself without having to register with a third party.
- Facilitates discovery and indexing mechanisms for use by a web robot in the process of generating a database for a "TV Anytime services search engine".

4. Fields of application of the invention

The invention applies to TV Anytime IP clients and servers.

Clients. Any device that wishes to receive information related to TV programme schedules could use this invention. Typically this will be a Personal Digital Recorder or some other TV device (Integrated Digital TV, set-top-box, etc.) that wishes to display TV schedules to a user. However, any other network-enabled devices could also exploit the invention for the same purpose. These include Personal Computers, mobile phones, PDAs, etc.

Servers. Any web server with the appropriate information can host a TV Anytime service. Most often this will be a broadcaster's web server, but also includes third party web sites providing specialised and enhanced metadata about TV programmes.

5. An example of the invention

The Web Services Inspection Language provides one standard method of specifying how to inspect a web site for available Web services. The

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WSInspection specification defines the locations on a Web site where you could look for Web service descriptions. The following URLs give an overview and the specification of WS-Inspection:

<http://www-106.ibm.com/developerworks/webservices/library/ws-wslover/>

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<http://www-106.ibm.com/developerworks/webservices/library/ws-wsilspec.html>

Figure 1 illustrates the format of a possible inspection.wsil file and Figure 2 illustrates the format of the corresponding service description file. Figure 3 illustrates the steps involved in finding new TV Anytime services.

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http://example.com/inspection.wsdl

```
<?xml version="1.0" encoding="UTF-8"?>
<inspection xmlns="http://schemas.xmlsoap.org/ws/2001/10/inspection/"
  xmlns:wsilwsdl="http://schemas.xmlsoap.org/ws/2001/10/inspection/wsdl/">
  <service>
    <description referencedNamespace="http://schemas.xmlsoap.org/wsdl/"
      location="http://example.com/tva_services.wsdl">
      <wsilwsdl:reference endpoint="true">
        <wsilwsdl:referencedService xmlns:ns="http://example.com/tva">
          ns:TvaCookingService</wsilwsdl:referencedService>
        </wsilwsdl:reference>
      </description>
    </service>
    <service>
      <description referencedNamespace="http://schemas.xmlsoap.org/wsdl/"
        location="http://example.com/tva_services.wsdl">
        <wsilwsdl:reference endpoint="true">
          <wsilwsdl:referencedService xmlns:ns="http://example.com/tva">
            ns:TvaMovieService</wsilwsdl:referencedService>
          </wsilwsdl:reference>
        </description>
      </service>
      ... References to other groups of TV Anytime services could be inserted here
    </inspection>
```

Fig. 1

http://example.com/tva_services.wsdl

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions targetNamespace="http://example.com/tva"
  xmlns:tva="http://www.tv-anytime.org/2001/11/transport/wsdl"
  xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
  xmlns="http://schemas.xmlsoap.org/wsdl/">
  <import namespace="http://www.tv-anytime.org/2001/11/transport/wsdl/">
  <service name="TvaCookingService">
    <port name="get_Metadata_Cooking" binding="tva:get_Resolution_Port">
      <soap:address location="http://example.com/cooking"/>
    </port>
    <port name="searchOn_Delivery_Cooking"
      binding="tva:searchOn_Delivery_Port">
      <soap:address location="http://example.com/cooking"/>
    </port>
  </service>
  <service name="TvaMovieService">
    <port name="get_Metadata_Movies" binding="tva:get_Metadata_Port">
      <soap:address location="http://example.com/movies"/>
    </port>
    <port name="searchOn_Description_Movies"
      binding="tva:searchOn_Description_Port">
      <soap:address location="http://example.com/movies"/>
    </port>
  </service>
</definitions>
```

The namespace indicates compliance with TVA, along with the version

The port name gives the type of TVA services supported

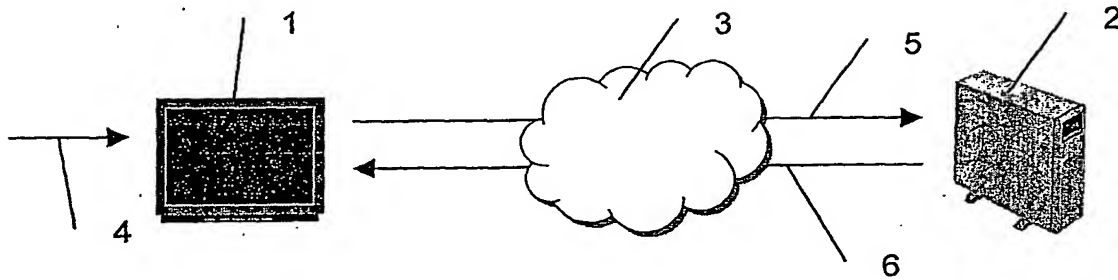
The entry points (URL) to the different constituent services

Fig 2

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The steps involved in finding new TV Anytime services.



1. Network enabled TV Anytime device (such as an integrated digital TV).
2. Remote network web server, possibly offering TV Anytime compliant web service (such as schedule listings, movie information, etc.).
3. A wide area network (such as the Internet).
4. A web server host name obtained by some means (such as those given in section 3).
5. A structured query from 1 to 2 (such as a SOAP request or an HTTP request).
6. A structured response from 2 to 1 (such as a SOAP request or an HTTP request).

To successfully find a TV Anytime web service the following sequence of requests (5) and responses (6) must occur.

- A. First, device 1 obtains a host name 4 (such as example.com).
- B. Device 1 makes an HTTP GET request to the server 2 for the well-known file (e.g. <http://example.com/inspection.wsil>).
- C. If the server 2 offers web services (not necessarily TV Anytime ones) it will return a successful HTTP response containing the requested file (inspection.wsil). If the server 2 offers no web services it will send back an HTTP 404 (file not found) response and the search process will terminate.
- D. Device 1 parses the file and establishes the endpoints of the service descriptions (such as the URL of a WSDL file describing how to use the services). All subsequent steps will be repeated for each of the end points found.
- E. Device 1 tries to obtain the service description for that endpoint. The exact mechanism for doing this depends on the service description protocol being used (such as UDDI or WSDL). In this case we will assume that WSDL is being used. To obtain the WSDL file, device 1 makes an HTTP GET request to the server 2 for the file (e.g. http://example.com/tva_services.wsdl).
- F. Device 1 parses the returned file and establishes if any of the described services are TV Anytime compliant services. This is determined by the XML namespace given to the services. If none of the endpoints offer TV Anytime services the search process will terminate. The file also allows device 1 to determine the precise technical version of each service as well as the URL where the service is offered. Device 1 now has all the information required to use the TV Anytime web service.
- G. At this stage device 1 may choose to cache the information on the TV Anytime services offered by that server, or to make use of those services immediately.

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Fig 3